



BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

A photograph of the Golden Gate Bridge in San Francisco, partially obscured by a thick layer of fog. The bridge's red towers and suspension cables are visible against a hazy blue sky.

Diesel Particulate Matter: Health Burden, Climate Impacts, and Regional & Local Assessments

Board of Directors Meeting
September 19, 2018

Judith Cutino, DO, PE, Health Officer

Phil Martien, PhD, Acting Director
Assessment, Inventory, & Modeling Division

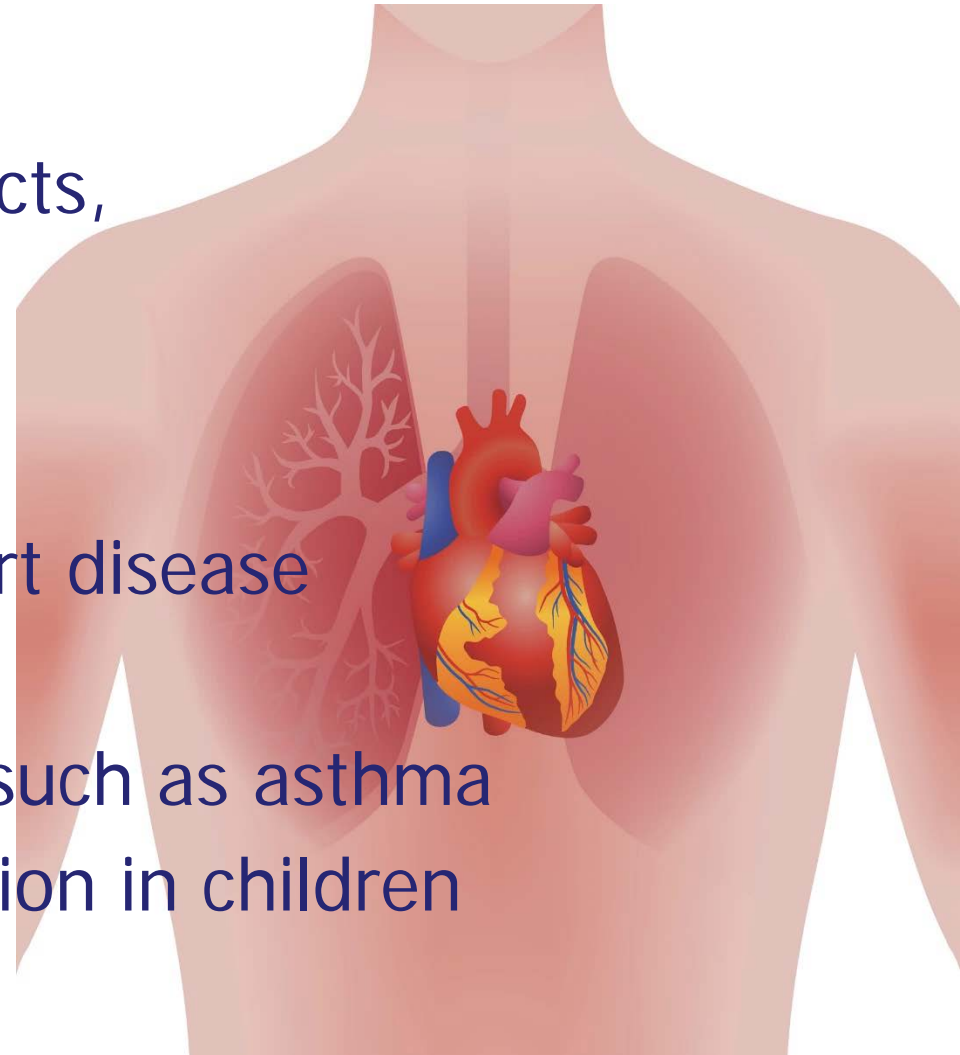
- Fine particles can penetrate deeply into the lungs causing cardiovascular, pulmonary and other health impacts
- Health effect studies have shown that diesel particulate matter (diesel PM) is a potent carcinogen
- Bay Area studies show diesel PM remains a significant contributor to regional cancer risk from air pollution
- Black carbon (BC) from diesel PM contributes to climate impacts
- Diesel PM from mobile sources still contributes a majority of the risk to vulnerable, impacted areas

- Major sources include heavy-duty trucks, trains, ships, and large generators
- Composed of carbon particles, inorganic solids, and over 40 known toxic air contaminants (TACs) including:
 - Polycyclic aromatic hydrocarbons
 - Benzene
 - Formaldehyde
 - Acetaldehyde
 - Acrolein
 - 1,3-Butadiene



Health Effects of Diesel PM

- Exposure contributes to non-cancer health effects, including:
 - Premature death
 - Increased risk of heart disease and stroke
 - Respiratory disease, such as asthma
 - Decreased lung function in children
 - Dementia



Studies of PM

- Harvard School of Public Health studies of Medicare patients:
 - Higher estimated risk of death from fine PM (PM_{2.5}) exposure
 - At concentrations below the current air quality standards
 - Higher effects for racial minorities, low socioeconomic status
- Numerous health studies show:
 - Increased health effects for those living near major sources of diesel PM
 - Example: higher new-onset asthma in children living near roadways

Diesel PM Identified as Carcinogen

- California Air Resources Board identified diesel PM as a Toxic Air Contaminant:
 - Cal EPA Office of Environmental Health Hazard Assessment (OEHHA) evaluation of diesel exhaust (1998)
- World Health Organization – International Agency for Research on Cancer classified diesel engine exhaust as carcinogen:
 - Lung cancer
 - Possible increased risk of bladder cancer

Who is Affected?

- Higher diesel PM near vulnerable Bay Area residents with low income and high cumulative health burden:
 - Disproportionately affecting people of color
- Those most vulnerable to health effects:
 - Children
 - Pregnant women
 - Elderly



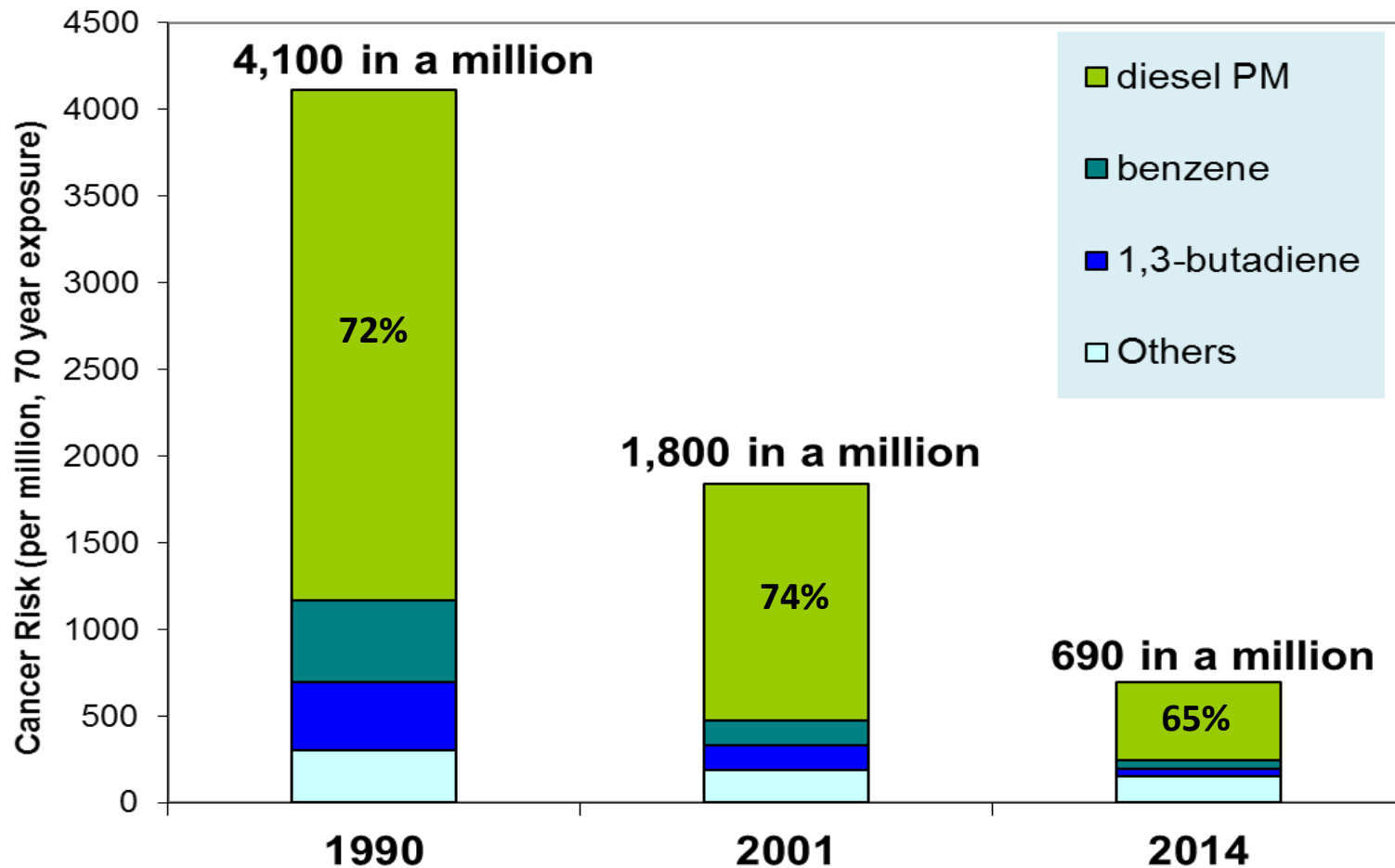
Diesel PM contributes to PM_{2.5}

- Bay Area (in 2014):
 - Diesel PM is about 6% of the regional annual average PM_{2.5}
- West Oakland Study (2009-10):
 - Diesel PM is 7% to 16% of PM_{2.5}
- Near diesel sources, the diesel PM fraction of PM_{2.5} can be much higher



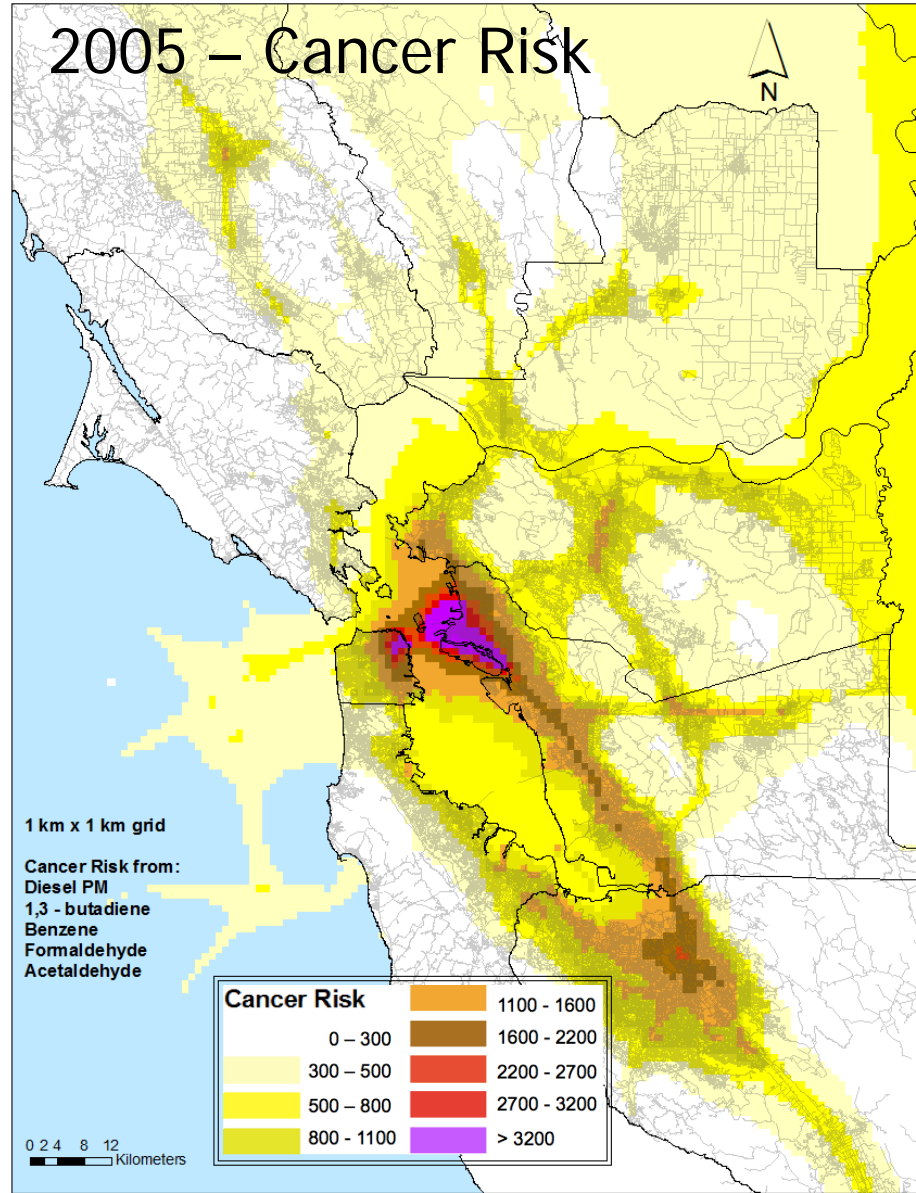
Diesel PM Contributes Most of the Cancer Risk from Ambient Air Pollution

Lifetime Cancer Risk Based on Air Monitoring

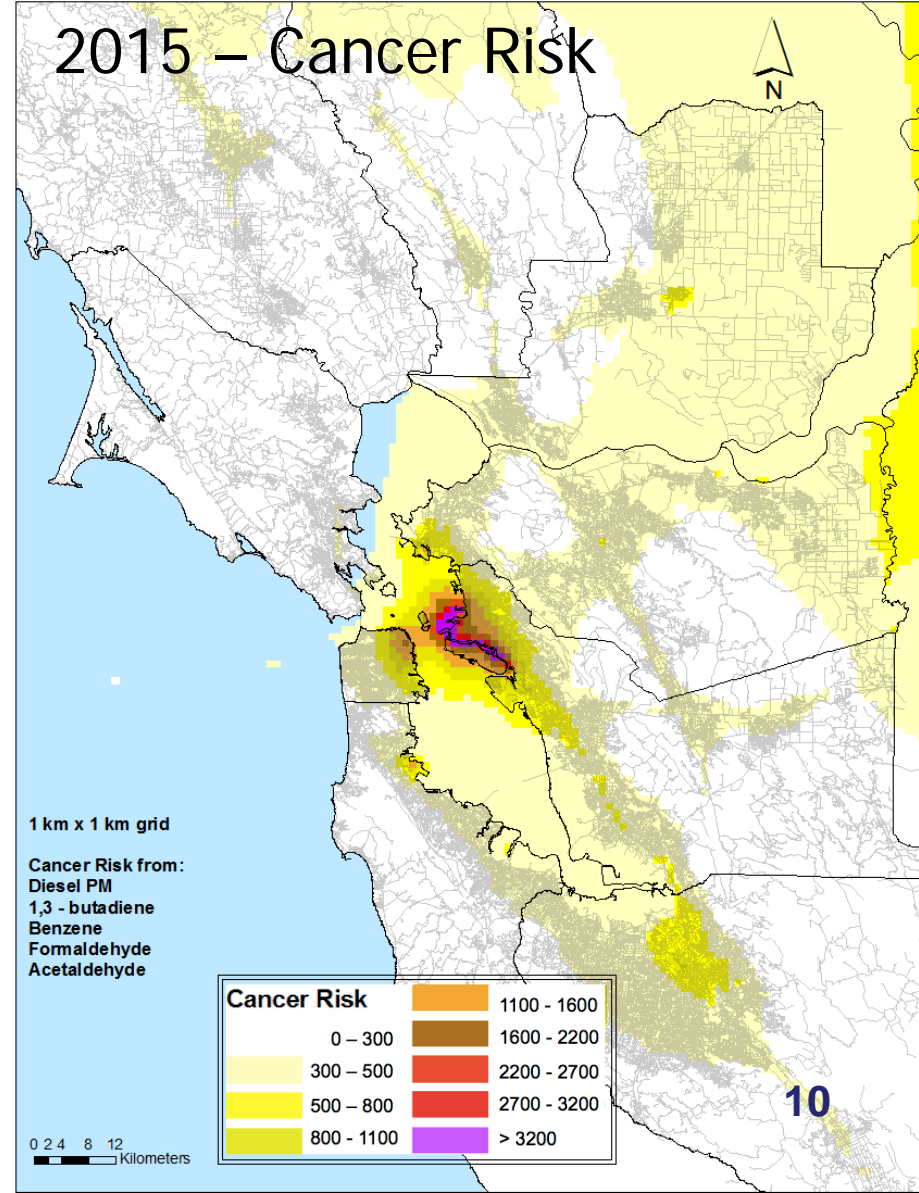


Cancer Risk from Air Pollution Down, but Higher Risks in Some Communities

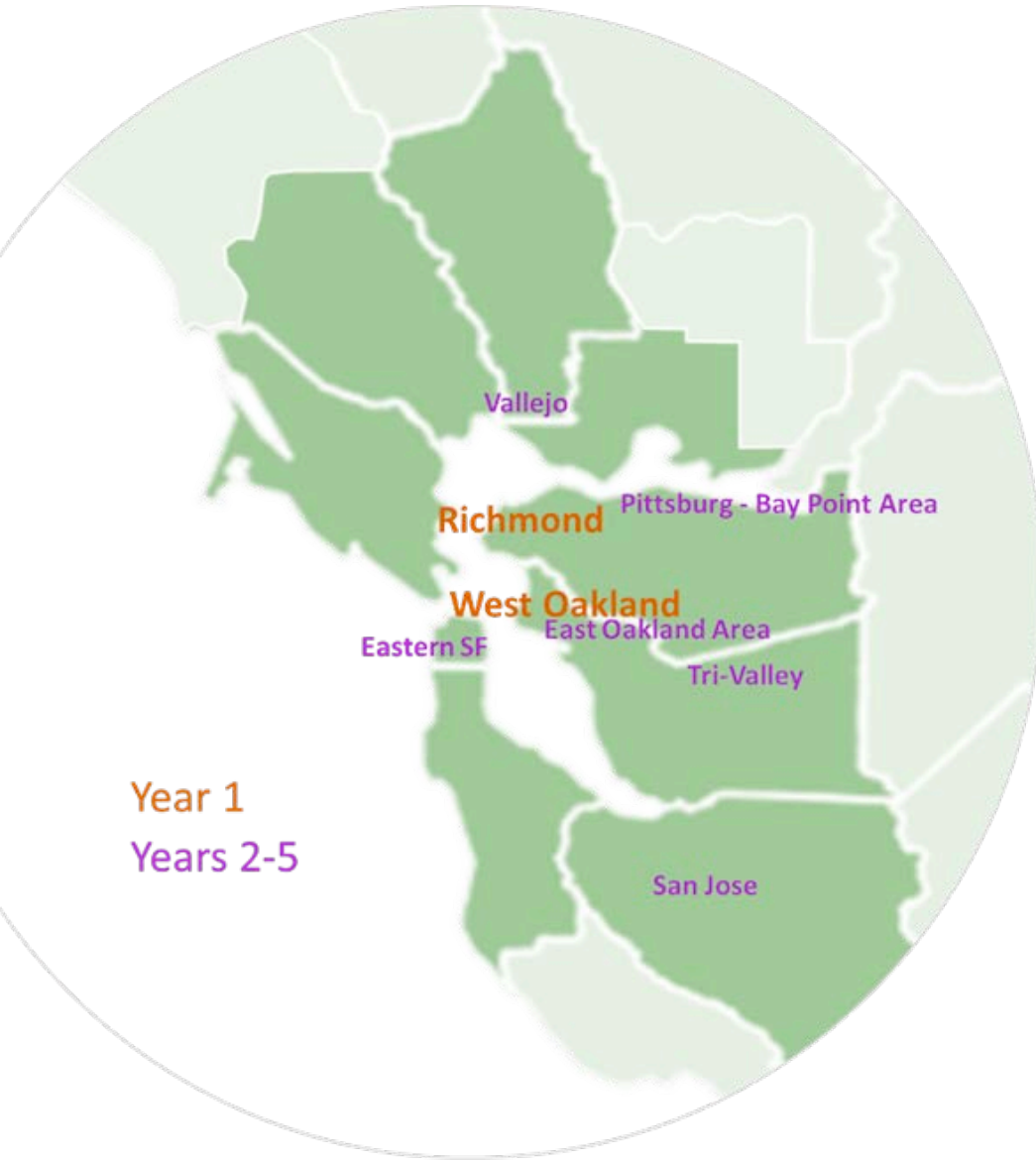
2005 – Cancer Risk



2015 – Cancer Risk



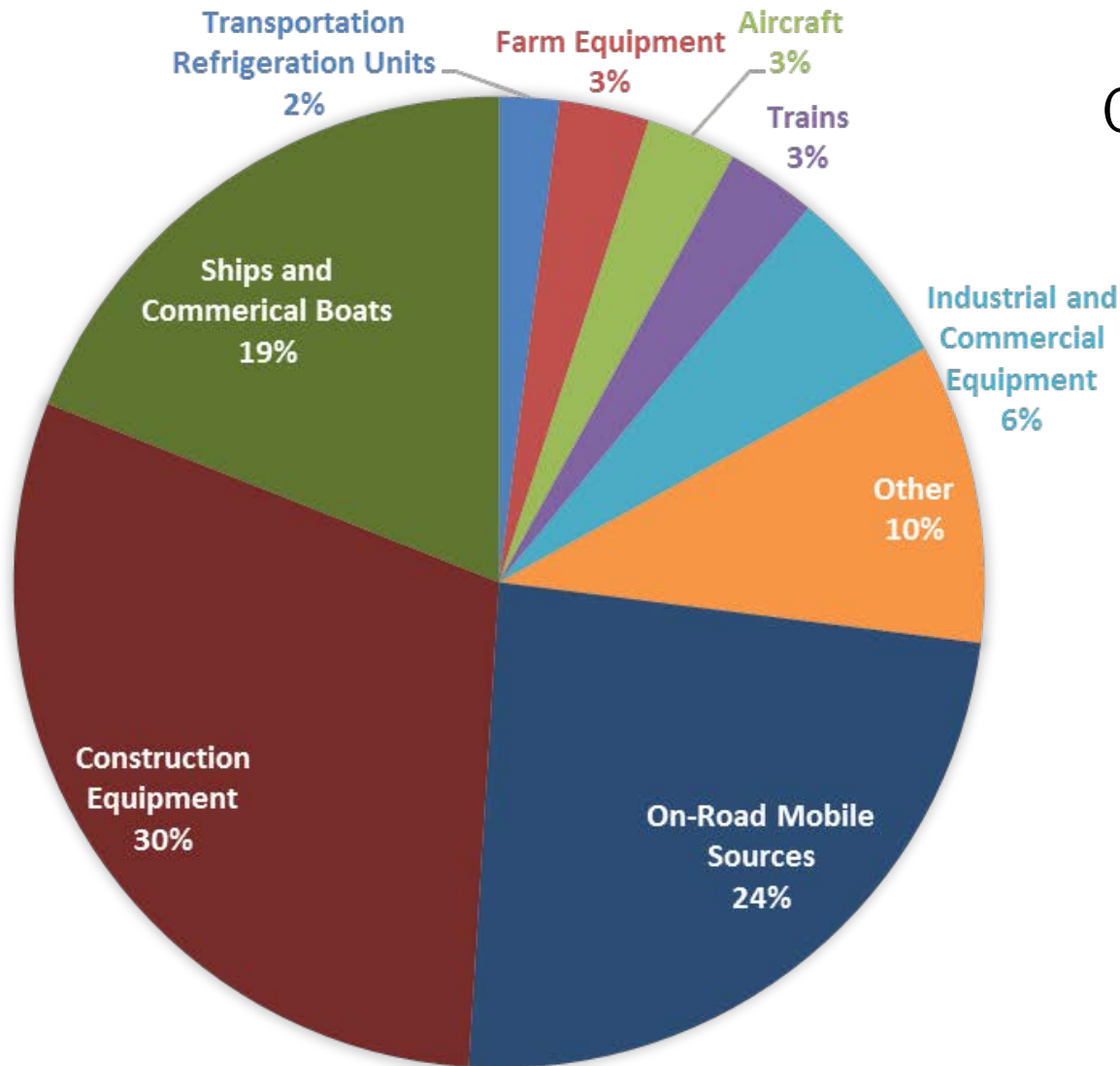
Diesel PM a Factor in Identifying the Bay Area's Most Impacted Communities



AB 617 Communities:

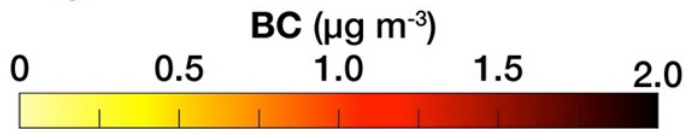
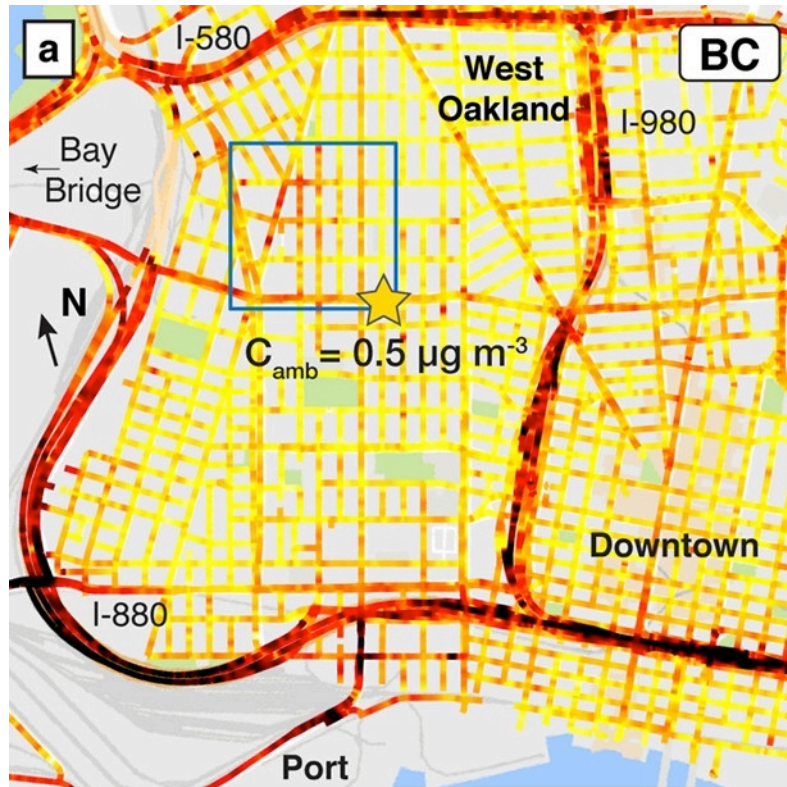
- Areas with higher adverse health outcomes
- Areas with higher exposure to diesel PM and other air pollutants

Most of the Toxic Air Contaminants Emitted are from Mobile Sources



Cancer-Risk Weighted
Toxic Emissions by
Source Category
(2015)

Concentrations of Diesel PM can be Much Higher Near Diesel Sources



★ = concentration C_{amb} at fixed-site monitor



- Black carbon (BC) measurements can help identify diesel sources

Diesel PM is a Source of Black Carbon and Warms the Climate

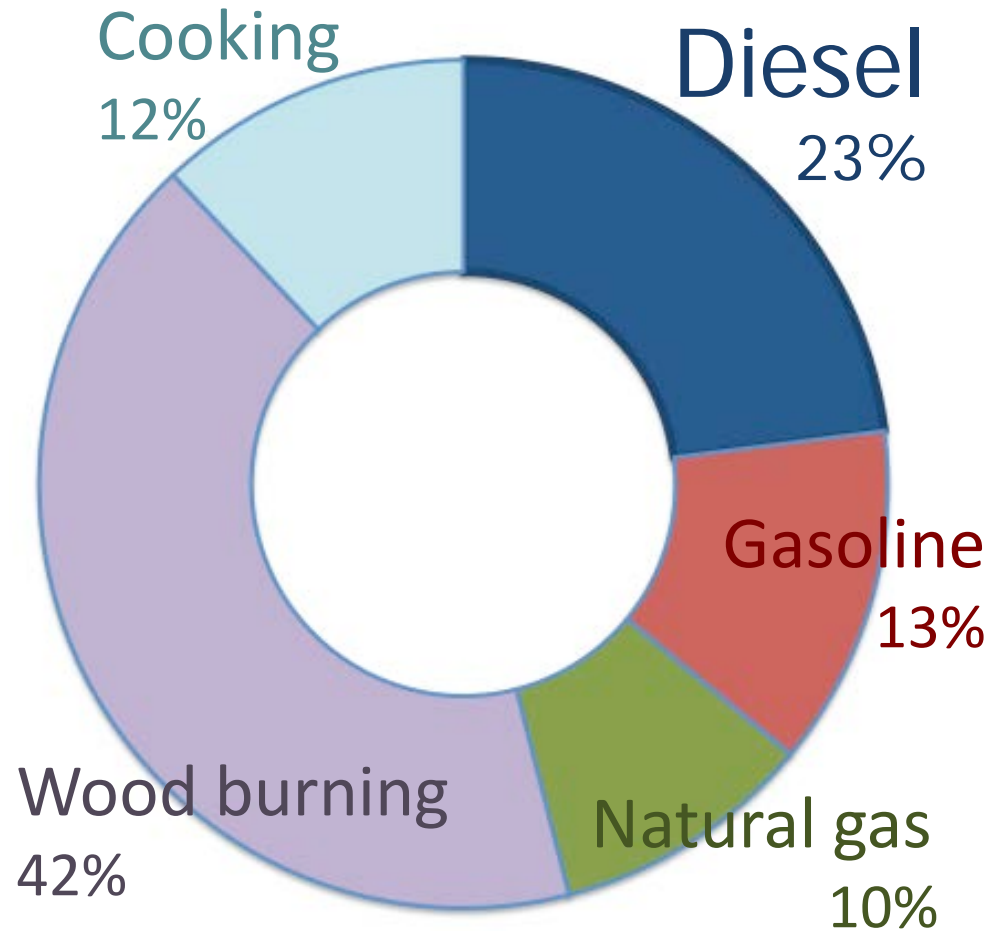
- Black carbon (BC) absorbs sunlight and warms the atmosphere
- When BC lands on snow or ice, it accelerates melting
- BC's warming influence is comparable to methane
- Reducing BC now has immediate climate benefits



Diesel Exhaust Contributes About 25% of the Black Carbon in the Bay Area*

The remainder is from

- wood burning (including wildfires);
- gasoline combustion;
- natural gas combustion; and
- cooking



* Annual basis, based on a 2011-2012 analysis

Diesel PM Contributes to Fine PM, Black Carbon, and Cancer Risk

Diesel PM/ Total PM _{2.5}	Diesel PM/ Total BC	Diesel PM Cancer Risk/ Cancer Risk from Ambient Air Pollution
5-15%	20-30%	60-70%

Current Controls are Not Fully Mitigating Adverse Effects of Diesel PM on Human Health and the Environment



- The long-term durability of diesel particle filters (DPFs) is a concern
- Some DPFs on 2007–2009 engines are failing:
 - For these engines, BC emission rates increased by 50–67% in 2015 relative to two years earlier

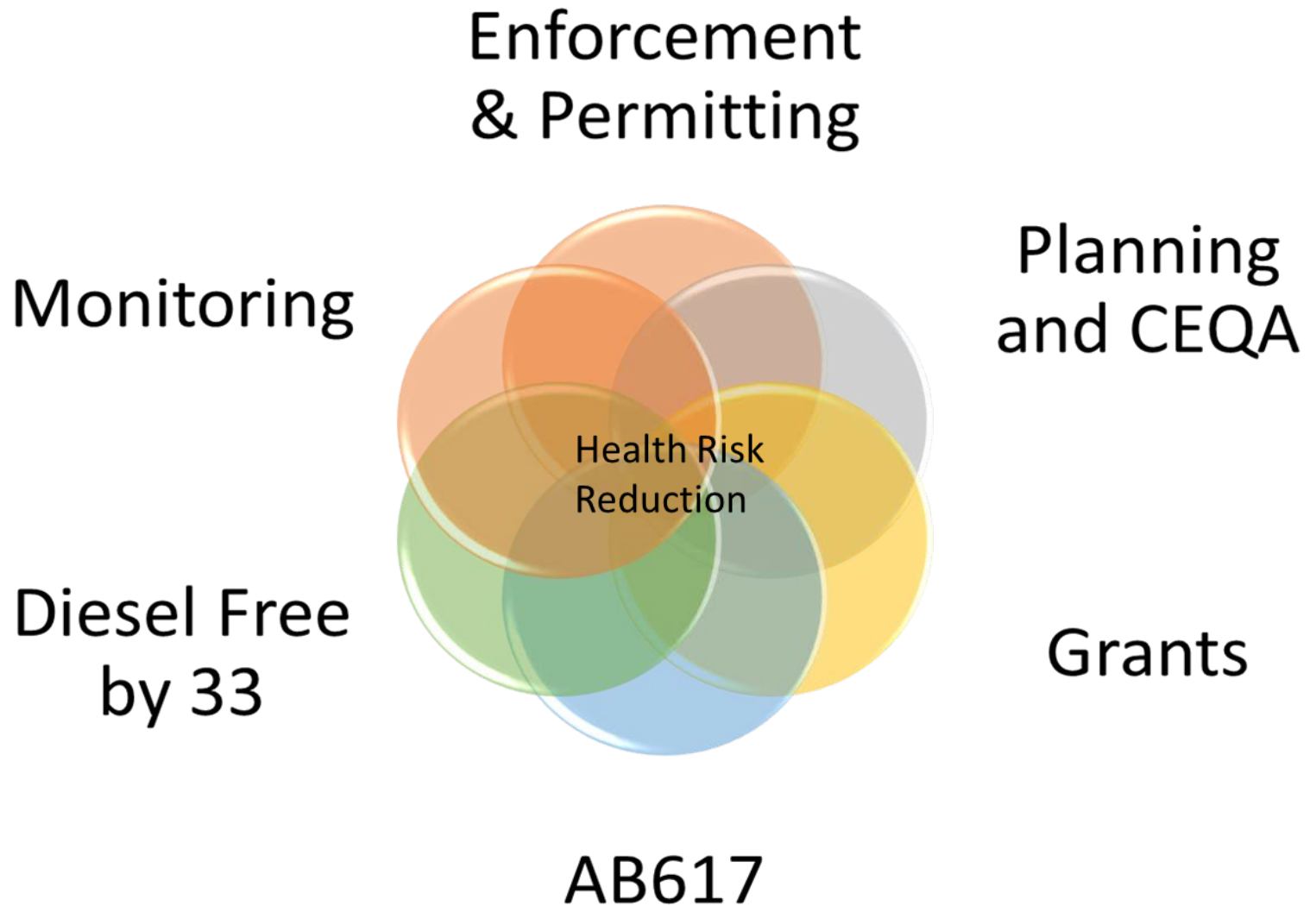
Key Findings

- Diesel PM is still the main contributor to cancer risk from toxic air contaminants
- Diesel PM, especially from mobile sources, is still an important contributor to health risk in impacted areas
- Fine PM of all types is linked to poor health outcomes and mortality
- Diesel PM is a significant source of black carbon, a climate forcing pollutant

Key Findings (continued)

- Grants, regulatory programs, and enforcement efforts have resulted in significant reductions in diesel PM
- More reductions in diesel PM are needed to prevent back sliding and to accelerate air quality improvements in impacted areas

Diesel Emissions Reduction Actions



DIESEL FREE BY '33

Board of Directors Meeting
September 19, 2018
Lisa Fasano
Communications Director



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Diesel Free by '33 – The Stats

- Attendees - 200
- Speakers - 35
 - Including nine Board Members
- Signatories - 120
- Board attendance 15



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Diesel Free by '33 - Signatories

40 cities/towns

- Albany, Belmont, Belvedere, Benicia, Berkeley, Brentwood, Cloverdale, Colma, Corte Madera, Cupertino, El Cerrito, Emeryville, Fairfax, Foster City, Fremont, Larkspur, Martinez, Morgan Hill, Milpitas, Mountain View, Newark, Novato, Oakland, Petaluma, Portola Valley, Richmond, Saint Helena, San Anselmo, San Jose, San Leandro, San Ramon, San Pablo, Santa Clara, Santa Monica, South San Francisco, Suisun City, Sunnyvale, Union City, and Windsor


6 counties

- Alameda, Contra Costa, Marin, San Mateo, San Ramon, and Santa Clara

18 organizations

- BART, Bloom Energy, California Ethanol and Power LLC, Capitol Corridor Joint Powers Authority, Center for Climate Protection, Dublin San Ramon Services District, FirstElement Fuel Inc., General Electric, Metropolitan Transportation Commission, Move LA, Port of Oakland, Prospect Silicon Valley, Proterra Inc., Silicon Valley Leadership Group, TransPower, UN Foundation, Water Emergency Transportation Authority (Bay Ferries), and West Oakland Environmental Indicators Project (WOEIP)





Diesel Free by '33 - Feedback

*Terrific event this past week!
Thank you for allowing me to
participate.*

David R. Rubenstein
CEO / President
California Ethanol + Power, LLC

*I enjoyed the event on Wednesday.
The event was well-attended.*

John A. Thornton
President
CleanFuture, Inc.

Darrell Steinberg@Mayor_Steinberg - Sep12

Today I signed the #DieselFree33 pledge at the @GCAS2018 Global Climate Action Summit. We're committing to adopting policies to reduce the diesel emissions that pollute our air in @TheCityofSac and contribute to climate Change.

Tanya Müller García@tmullergarcia - Sept 12

A pleasure to participate with Greg Dalton, founder of @climateone and to highlight efforts to mitigate emissions through sustainable public transport systems and technologies that allow the transition to Zero emissions #GCAS2018 #DieselFree33





Diesel Free by '33



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Climate Tech Marketplace

September 13, 2018, 4 – 7 pm



REGISTER FOR THE
**CLIMATE TECH
MARKETPLACE**



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SEPT. 13, 4-7PM
375 BEALE ST., SAN FRANCISCO

A background image of green hills under a blue sky, used as a backdrop for the event registration graphic.

Event website:

<http://dieselfree33.baaqmd.gov/climate-tech-marketplace>

Over 275 Attendees

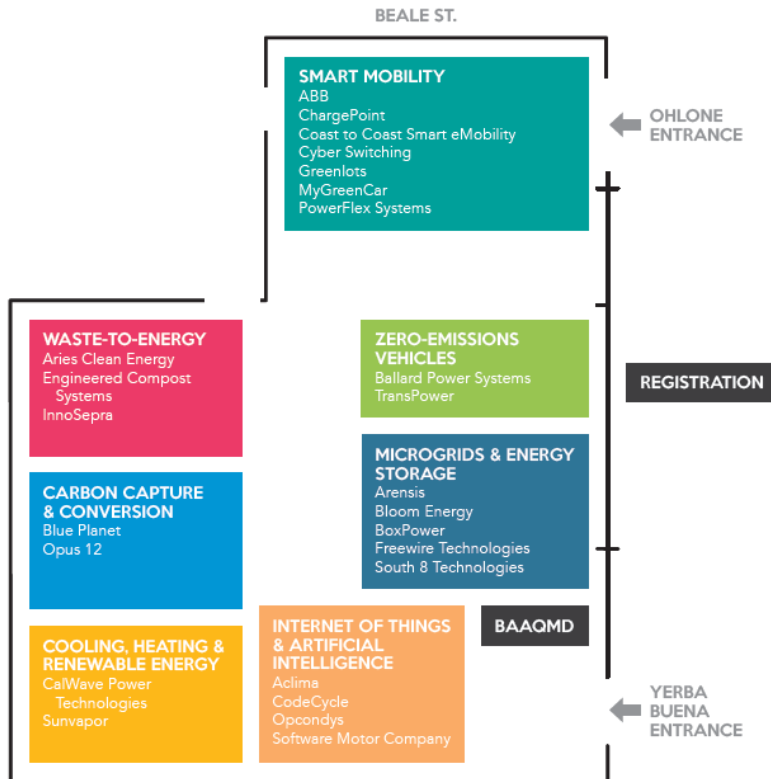


- **Global Summit participants:** Connect with thriving Bay Area technology industry
- **Technology developers:** Showcase technologies, identify partners and customers
- **Governments and businesses:** Identify new technologies that can help them meet climate commitments
- **Industry accelerators:** See the Air District as partner in supporting technology development and implementation
- **Investors:** Identify new technologies for impact and investment
- **VIP preview:** State and local government officials, investors, media

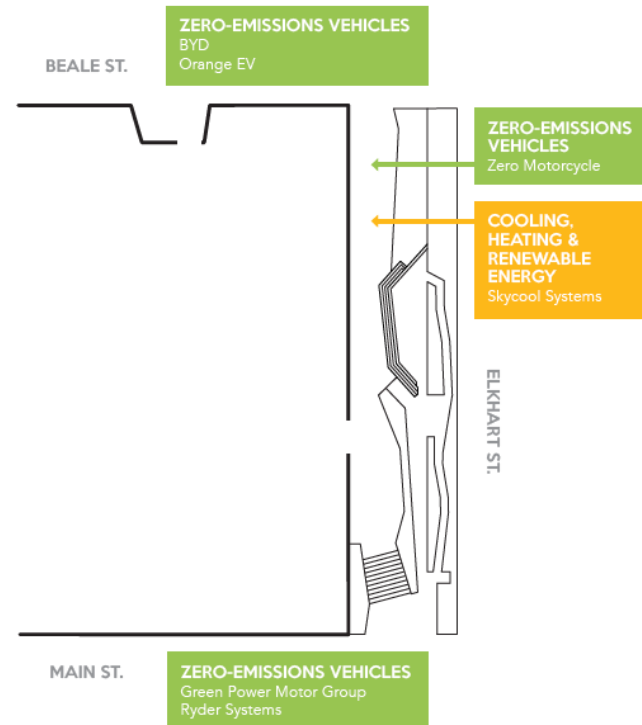
Over 30 Technology Companies



INDOOR EXHIBITORS



OUTDOOR EXHIBITORS



Broad Goals Achieved



- Showcased the Air District's and Technology Implementation Office's growing role to connect emerging technologies with customers in the Bay Area
- Followed the Air District's Diesel Free by '33 signing ceremony by offering concrete solutions and partnerships for implementing commitments
- Increased awareness about Air District grant and loan opportunities for mobile and stationary technologies



Acknowledgements

Diesel Free by '33 & Climate Tech Marketplace

Communications Office

Ralph Borrmann
Simrun Dhoot
Tom Flannigan
Tina Landis
Jocelyn Orpia
Aaron Richardson
Kristine Roselius
Jessica Sanchez
Madeleine Shiber
Walter Wallace
Sarah Zahedi

Community Engagement

Kristina Chu
Aneesh Rana

Planning

David Burch
Areana Flores
Karen Fremming
Axum Teferra
Abby Young
Jakub Zielkiewicz

Executive Office

Kristine Garcia
Vanessa Johnson
Helen Lee
Marjorie Villanueva

Metropolitan

Transportation

Commission

Krute Singa
Brenda Kahn

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Raymond Gin
Joanne Liang
Jun Pan
Felipe Songco
Liya Tekletsion
Raymond Wang
Danica Winston
Cynthia Zhang

Sponsors

MTC
NextGen
PowerFlex Systems
ChargePoint

Technology Implementation Office

Brian Butler
Lucian Go
Tin Le
Derrick Tang
Mark Tang
Karissa White
Deanna Yee

Rule Development

Robert Cave
Idania Zamora

Strategic Incentives

Linda Hui
Ken Mak
Chengfeng Wang

Agency/Contractor

Bay Area Metro Center
Cushman & Wakefield
O'Rorke

CERTIFICATE OF APPRECIATION

THANK YOU FOR JOINING
UNITED AGAINST GHGs
AND COMMITTING TO GO
DIESEL FREE BY '33

SEPTEMBER 12, 2018



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GLOBAL
CLIMATE
ACTION SUMMIT

Summary of Ozone Seasons

Year	National 8-Hour	State 1-Hour	State 8-Hour
2015*	5	4	11
2016	15	5	15
2017	6	6	6
2018	3	2	3

Spare the Air Alerts: 06/22/18, 06/23/18, 6/30/18, 7/26/18, 8/8/18, 8/9/18, 8/18/18, 8/19/18, 8/23/18, 8/24/18, 9/3/18

Days > 0.070 ppm 8-hour NAAQS: 8/3/18, 8/9/18, 8/18/18

*Based on NAAQS of 0.075 ppm that was in place during that year

Winter PM_{2.5} Seasons

Year	Days > 35 µg/m ³	Winter Spare the Air Alerts
2014/2015	6	23
2015/2016	0	1
2016/2017	0	7
2017/2018	8	19

- Spare the Air Alert Called for: 12/8/17 – 12/15/17, 12/22/17 – 12/26/17, 12/29/17 – 12/31/17, 1/1/18, 1/2/18, 1/15/18
- Days > 35 µg/m³ 24-hr NAAQS: 12/15/17, 12/24/17, 12/30/17, 12/31/17, 1/1/18, 1/2/18, 1/3/18, 1/4/18

Calendar Year Summary

Year	National Ozone Exceedances	Days > 35 $\mu\text{g}/\text{m}^3$ due to Wildfires (PM _{2.5})	Total Days > 35 $\mu\text{g}/\text{m}^3$ (PM _{2.5})
2014	5*	0	3
2015	5*	3	9
2016	15	0	0
2017	6	14	18
2018	3	2	6

For Ozone - Days > 0.070 ppm 8-hour NAAQS: 08/03/18, 8/9/18, 8/18/18

* Based on NAAQS of 0.075 ppm that was in place during those years

For Wintertime - Days > 35 $\mu\text{g}/\text{m}^3$ 24-hr NAAQS: 12/15/17, 12/24/17, 12/30/17, 12/31/17, 1/1/18, 1/2/18, 1/3/18, 1/4/18

(Other exceedances occurred due to wildfires outside of the November 1 – February 28 timeframe)